

REMARKSThe Amendments:

The independent claims 1 and 8 have been amended to correct the viscosity and melt index values and to provide the measurement units for these properties. These claims have also been amended to recite the thickness of the antimicrobial coating applied in the invention and to direct the subject matter to polyethylene objects. Support for these recitations can be found in the specification at page 7, lines 18-21 and in Examples 1 and 2.

Claims 15 and 16 are newly added and recite limitations which are disclosed in the specification at page 5, lines 2-3. Claims 17 and 18 are newly added and recite limitations disclosed in the specification at page 9, lines 24-25.

The Invention

Applicant's invention is a cost effective treatment of polyolefin articles, particularly articles molded of polyethylene, to impart a permanent antimicrobial coating to the articles. An antimicrobial agent is admixed with a polyolefin fusible solid and the mixture is suspended or dissolved in a liquid carrier to obtain a coating composition which is applied at a thickness from 0.1 to 5 mils to the surface of a preformed polyolefin object, or to the interior surface of a mold cavity used to form the polyolefin object. When applied to the surface of a preformed part, the coated surface is heated to the polyolefin melting point to fuse the coating into the surface of the polyolefin part (from 250° to 550° F.; see page 8, lines 4-20). When the coating is applied to the interior surface of a mold cavity, it is heated in the subsequent molding step in which the mold is heated to the melting temperature of the polyolefin; see page 7, lines 16-26 and Example 2, page 9, lines 14-19. Because applicant applies only a thin coating of the

antimicrobial composition, the physical properties of the polyolefin part are not degraded. Applicant's treatment is very economical since applicant employs only a minor amount of the relatively expensive antimicrobial agent and the treatment is permanent as the coating is fused into the wall of the polyolefin object.

The Rejections

Claims 1 and 8 were rejected under 35 U.S.C. §112 as lacking support by reciting values for the viscosity of the hydrocarbon resin which were not supported in the specification. The claims were also rejected as indefinite for failure to recite the units of measurements for viscosity and melt index.

Claims 1-7 were rejected as unpatentable under 35 U.S.C. §103 as considered obvious by the examiner from the teachings of Trogolo et al and Watanabe. Claims 8-14 were rejected as unpatentable under 35 U.S.C. §103 as considered obvious by the examiner from the teachings of Guiste and Trogolo et al.

The Prior Art References:

Trogolo et al recognize that the properties of a polymer are degraded when an antimicrobial additive is compounded into the polymer; column 2, lines 11-20. Trogolo et al also teach that when an antibiotic zeolite is incorporated into a polymer, which is hydrophobic, the bulk of the zeolite is ineffective; column 1, lines 62-64. Because of these problems, Trogolo et al teach that the antibiotic agent should be dispersed in a hydrophilic polymer and the resultant composition can be applied as a coating to "any substrate to which the hydrophilic polymer adheres"; column 5, lines 42-44.

Watanabe teaches compounding an anti-bacterial agent into a mixture of synthetic rubber and hard chloroethene, and kneading and molding the resultant mixture into a cutting board.

Guiste discloses a bathtub liner which is molded from thermoplastics, including polyethylene. The liner is an impermeable, flexible film of a thermoplastic of sufficient thickness that it is substantially durable; column 2, lines 27. The drawings illustrate the liner as a solid-form film (Figures 4, 5 and 12) or as pads interspaced by solid-form films. Guiste states that an antimicrobial agent can be incorporated in the liner by blending the agent into the polymer; column 6, lines 63-65.

The Miyaka et al and Jacobson et al patents have been reviewed and Applicant agrees with the examiner that while these patents are of interest, they are not applicable to a rejection of the claims.

Applicant's Arguments:

Regarding Claims 1-7, 15 and 17:

Trogolo et al do not teach the use of a polyolefin that is fusible with polyethylene. Instead, the patentees disclose that the the antibiotic agent (zeolite) is to be admixed with a hydrophilic polymer. The examiner has cited a statement in the Trogolo et al patent that the antibiotic zeolites are often obtained in master batches of low density polyethylene, polypropylene or polystyrene containing 20 wt. % of the zeolite. Throughout the entire remainder of the patent, however, there is absolutely no mention of the use of the "master batch" of zeolite, nor is there any suggestion that the "master batch" could be used with the hydrophilic polymer which is the necessary carrier for the zeolite. Instead, the patent consistently discloses mixtures of zeolite (not zeolite master batches) in hydrophilic polymers. Polyethylene, polypropylene and polystyrene are hydrophobic and for this reason, alone, one skilled in the art would never conclude that a master batch containing a substantial proportion of these hydrophobic polymers would be used in the Trogolo et al hydrophilic coating; see the disclosure that zeolites in a hydrophobic polymer are ineffective; column 1,

lines 61-63.

Watanabe does not disclose a coating of any nature. Instead, he discloses molding a rubber compounded with antibacterial zeolite which is "uniformly and evenly dispersed" (column 3, lines 39-40) in the mixture of rubber and chloroethene. That homogeneous mixture is molded by heat and pressure into a cutting board. This patent exemplifies the disadvantages of the prior art in that excessive amounts of the expensive antibacterial agent is used throughout the entire thickness of the molded object. There is no disclosure of a coating, a laminate or fusion of two layers of any compositions in Watanabe's patent.

Applicant submits that it would not be within the skill of the art to arrive at the claimed method from the disclosures of Trogolo et al and Watanabe. Applicant's method requires fusing a coating into the wall of a polyethylene object. Trogolo et al state that incorporating an antibiotic zeolite into a hydrophobic polymer renders the zeolite ineffective. Why then, would any one skilled in the art ever desire to fuse a zeolite-containing coating into the polyethylene object? In this respect, Trogolo et al are the antithesis of the obviousness of Applicant's claimed invention.

Even if the afore cited statement by Trogolo et al is ignored or dismissed, there is still no suggestion that the hydrophilic coating of this patent could be fused into a polyethylene object. Watanabe can not supply this suggestion, as Watanabe molds an entirely unrelated mixture of rubber and chloroethene into a homogeneous product useful as a cutting board.

Finally, a hydrophilic polymer, such as the hydrophilic polyurethane used by Trogolo et al, can not, in any application, be fused into a polyethylene object. The polymers are not fusible because of their hydrophilic/hydrophobic incompatibility.

It is noted that Trogolo et al suggest that polyethylene can be used as a substrate for their coating (column 5, line 45). This suggestion, however, is

preceded by the statement that the substrate must be one to which the hydrophilic polymer adheres and conditioned by the statement that a:

“primer may be applied to the substrate ... to help bind the hydrophilic polymer to the substrate”; column 6, lines 56-58

Polyethylene is notoriously non-receptive to coatings and Trogolo et al can never secure a permanent bonding of their hydrophilic polymer to the surface of a polyethylene object. Applicant's claims recite that the method imparts permanent activity to the surface of polyethylene and exclude the step of applying a primer to the object before application of the antimicrobial coating.

Regarding Claims 8-14, 16 and 18:

As pointed out in the discussion of the Guiste patent, when an antimicrobial agent is to be used, Guiste blends the agent into the polymer which is used to form the bathtub liner. This is exactly the approach that is avoided by Applicant's invention, for Guiste's method unavoidably degrades the structural properties of the polymer; see Trogolo et al, column 2, lines 18-20. Additionally, this approach uses excessive amounts of the relatively expensive antimicrobial agent which is dispersed uniformly throughout the entire plastic liner, rather than only where the agent is needed, on the exposed surfaces of the liner.

Applicant's attorney is unable to locate any disclosure or suggestion in the Guiste patent that a coating is to be applied to the interior surface of a mold. The text cited by the examiner for this teaching, i.e., column 3, lines 53-56 and column 4, lines 1-4, relate to other matters.

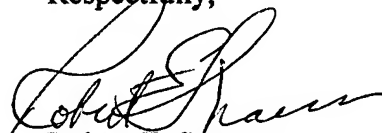
If, as the examiner suggests, one skilled in the art would obviously employ Trogolo's anti-microbial composition in Guiste's molding process, that composition would be blended into the polymer used to mold the object. That, of course, is contrary to the teachings of Trogolo et al that this renders the agent ineffective (column 1, lines 62-64) and that this also reduces the physical

properties of the polymer (column 2, lines 17-19).

Nowhere, in any of the cited prior art is there any suggestion that a coating containing an antimicrobial agent could be sprayed onto the interior surface of a mold and that coating would be transferred to the surface of an object formed in the mold. Furthermore, there is no suggestion in any of the prior art that the coating, if formed of a mixture of antimicrobial agent and a polyolefin fusible solid would fuse into the wall of the molded object, and would still show concentrations of the antimicrobial metal at the surface of the object in excess of the minimal concentrations necessary for antimicrobial activity. This result, by and in itself, is surprising in view of the statement by Trogolo et al that incorporating an antimicrobial agent in a hydrophobic polymer renders the agent ineffective.

It is submitted that the claims, as amended, are in proper form and scope and define invention over the prior art for the reasons set forth herein. Reconsideration and allowance are respectfully solicited.

Respectfully,


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